

# BIOCHEMISTRY (BCHM)

## Degrees Offered: Ph.D., M.S.

*This program is offered in Durham.*

The Department of Molecular, Cellular, and Biomedical Sciences offers an accelerated master's program (B.S./M.S.), a master's of science, and a doctor of philosophy degree in biochemistry. Graduate students in biochemistry are typically supported by teaching or research assistantships, as well as by competitive internal and external fellowship programs. For more information about the program, including admission and degree requirements, please contact the Department of Molecular, Cellular, and Biomedical Sciences at [mcbs.dept@unh.edu](mailto:mcbs.dept@unh.edu).

### Distinctive Features of the Program

The Graduate Program in Biochemistry combines a rigorous curriculum in biochemistry with diverse research opportunities at the frontier of chemical, molecular and cellular biology. The program aims to train interdisciplinary future researchers, savvy in modern technologies and data-science, to advance a mechanistic understanding of biology. Incoming students are given the opportunity for laboratory rotations to explore the various areas of biochemistry in those cases where a thesis advisor has not been identified or where exposure to a variety of experimental approaches is advantageous.

The Graduate Program in Biochemistry offers:

- Outstanding research training in many cutting-edge research areas in cellular structure and function, genome stability, protein structure and function, lipid metabolism, signal transduction, structural biology, and transcriptional and translational regulation.
- Weekly seminar series that includes both distinguished invited speakers and graduate student research presentations.
- Opportunities to gain teaching and mentoring experiences with undergraduate students in the biological sciences.
- Strong track record for graduates attaining careers in academia, biomedical research institutes, biotechnology and pharmaceutical companies, and state and federal governmental agencies.

### Admission Requirements

An applicant is expected to have completed basic courses in chemistry, biological sciences, mathematics, and physics. Otherwise well-qualified applicants will be permitted to correct deficiencies in undergraduate education by enrollment in the appropriate courses or by independent study during the first year. Applicants must submit a personal statement, current scores (within five years) from the general GRE test, and three letters of recommendation. If possible, the personal statement should specify the applicant's research interests and potential faculty mentors. International applicants living outside the U.S. should initially complete a free online pre-application (<http://gradschool.unh.edu/international.php>).

Applicants from non-English-speaking countries must also provide TOEFL (Test of English as a Foreign Language) scores.

### 5 Year Accelerated Master's Degree Requirements

This accelerated five-year program leading to a combined bachelor and master's degree in biochemistry is designed for highly motivated and qualified students seeking additional training to further their career goals as a researcher in the life sciences.

Admission to the combined degree program is highly competitive. Students wishing to pursue this option must have a grade point average greater than 3.2 at the time of application. A thesis advisor must be identified during the junior year, and the approval of the advisor must be obtained. Prior to the first semester of the senior year, the student must formally apply through the Graduate School and receive early admission to the Biochemistry Graduate Program. The requirement for the Graduate Record Examination is waived for combined degree applicants.

<https://colsa.unh.edu/molecular-cellular-biomedical-sciences>

## Programs

- Biochemistry (Ph.D.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/biochemistry/biochemistry-phd>)
- Biochemistry (M.S.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/biochemistry/biochemistry-ms>)

## Courses

### Biochemistry (BCHM)

#### BCHM 802 - Endocrinology

**Credits:** 4

Structure and function of vertebrate endocrine systems through the lens of physiology, biochemistry, and cell and molecular biology, with special reference to mammals. Current investigations of the body's major endocrine glands, such as the brain, thyroid, pancreas, adrenals and gonads, as regulators and integrators of biological systems. A previous cell biology course is recommended. Prereq: one semester of biochemistry.

#### BCHM 850 - Physical Biochemistry

**Credits:** 3

Structure, interactions, and physical-chemical properties of biomolecules. Thermodynamic, kinetic, and spectroscopic methods for the study of proteins and nucleic acids. Prereq: 2 semesters organic chemistry, 1 semester of calculus; or permission.

#### BCHM 851 - Principles of Biochemistry I

**Credits:** 4

In-depth survey of biochemistry: macromolecule structure; structure and function of proteins, nucleic acids, carbohydrates, and lipids; introduction to metabolic pathways. Prereq: One semester of organic chemistry; or permission.

#### BCHM 852 - Principles of Biochemistry II

**Credits:** 4

In-depth survey of biochemistry: metabolism of amino acids, nucleotides, carbohydrates and lipids; macromolecules synthesis and regulation; molecular biology of the eukaryotic cell. Prereq: BCHM 851 or permission.

#### BCHM 854 - Molecular Biology Research Methods

**Credits:** 5

Theory and application of current technologies to manipulate DNA. Hands-on experience that includes DNA isolation and quantitation methods, cloning, PCR, DNA sequencing, and analysis of gene products. Prereq: introductory genetics. Special fee. Lab.

**BCHM 855 - Laboratory in Biochemistry and Molecular Biology**

**Credits:** 5

Application of modern techniques to the characterization and purification of bio-molecules, with an emphasis on proteins and nucleic acids. Analysis of enzyme kinetics and basic techniques used in molecular biology. Prereq: one semester of biochemistry or permission. Special fee.

**BCHM 860 - Pharmacology**

**Credits:** 4

Introduction to the basic principles and fundamental concepts of pharmacology, with a focus on molecular mechanisms and pathological basis of therapeutics and the curative effects. Topics include: foundations of pharmacology including pharmacodynamics and pharmacogenomics; drugs affecting the nervous system (neuropharmacology); drugs affecting other systems; chemotherapeutic drugs. Prereq: one semester of biochemistry or permission.

**BCHM 863 - Biochemistry of Cancer**

**Credits:** 4

Evaluation of the hallmarks of cancer, including molecular mechanisms of carcinogenesis, roles of oncogenes and dysregulated cell development, function and metabolism, tumor immunology, and the biological basis of cancer therapy. Prereq: one semester biochemistry or permission.

**BCHM 883 - Proteomics for Biological Discoveries**

**Credits:** 4

Large-scale, high-throughput study of proteins; characterization of entire set of proteins in a biological sample (proteome); quantification of changes in protein composition, interactions and post-translational modifications; major technology platforms; pharmaceutical and biomedical applications. Develop skills in processing samples from research projects; analysis of mass spectrometric data. Prereq: one semester of biochemistry or permission.

**BCHM 894 - Protein Structure and Function**

**Credits:** 4

Analysis of how the three-dimensional architecture of soluble and membrane proteins contributes to their biochemical function; methods for determining the structure of proteins; protein folding; protein targeting; and mechanisms of enzyme catalysis. Computer resources will be used for protein modeling and structural prediction. Prereq: one semester of biochemistry.

**BCHM 895 - Special Topics**

**Credits:** 1-4

Special topics course.

**BCHM 899 - Master's Thesis**

**Credits:** 1-10

May be repeated to a maximum of 10 credits. Cr/F.

**BCHM 999 - Doctoral Research**

**Credits:** 0

Cr/F.

## Faculty

See <https://colsa.unh.edu/molecular-cellular-biomedical-sciences/people> for faculty.